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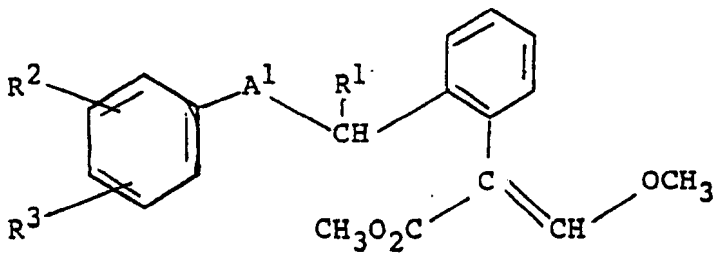
(54) Insecticides.

(57) The use as insecticides, miticides or nematicides of compounds of formula (I):



(I)

wherein R^1 is hydrogen or alkyl; R^2 is hydrogen, halogen, alkyl, alkoxy, hydroxy, aryl, heteroaryl, heteroalicyclic, arylalkyl, heteroarylalkyl, aryloxy, heteroaryloxy, arylalkenyl, heteroarylalkenyl, aryloxyalkyl, heteroaryloxyalkyl, arylalkoxy, heteroarylalkoxy, $-CO_2R^5$, alkyleneCO_2R^6, monoalkylamino or dialkylamino; R^3 is hydrogen, halogen, alkyl, alkoxy, hydroxy, monoalkylamino, dialkylamino or $-CO_2R^4$; or R^2 and R^3, when they are in adjacent positions on the phenyl ring, together form :

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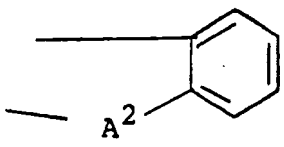


;

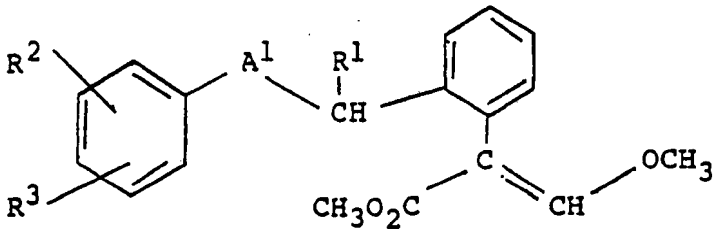
A^1 and A^2, which are the same or different, are O, $S(O)_n$, NR^7 or $NCOR^8$; n is zero, 1 or 2; and R^4, R^5, R^6, R^7 and R^8 are hydrogen or alkyl;
or when A^1 is $N(CH_3)$ R^2 may also be 2-NO_2; any of the foregoing aliphatic moieties being optionally substituted with one or more of halogen, hydroxy, alkoxy or haloalkoxy, and any of the foregoing aryl, heteroalicyclyl or heteroaryl moieties being optionally substituted with one or more of halogen, alkyl, nitro, alkoxy, haloalkyl, haloalkoxy or $CH_3O_2C.C=CH.OCH_3$.

INSECTICIDES

The present invention relates to a method of killing or controlling insect, mite or nematode pests and to compositions for use in that method.

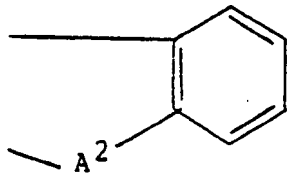
European Patent Publications Nos. 0226917 and 0278595 describe propenoic acid derivatives useful as fungicides. It has now been found that certain of these compounds have useful insecticidal, miticidal and nematocidal activity. In addition, the compounds may have knockdown activity against flies and mosquitoes.

According to the present invention there is provided a method of killing or controlling insect, mite or nematode pests which comprises applying to the pest or to the locus thereof an effective amount of a compound of formula (I) :



(I)

wherein R^1 is hydrogen or alkyl; R^2 is hydrogen, halogen, alkyl, alkoxy, hydroxy, aryl, heteroaryl, heteroalicyclyl, arylalkyl, heteroarylalkyl, aryloxy, heteroaryloxy, arylalkenyl, heteroarylalkenyl, aryloxyalkyl, heteroaryloxyalkyl, arylalkoxy, heteroarylalkoxy, $-CO_2R^5$, alkyleneCO_2R^6, monoalkylamino or dialkylamino; R^3 is hydrogen, halogen, alkyl, alkoxy, hydroxy, monoalkylamino, dialkylamino or $-CO_2R^4$; or R^2 and R^3, when they are in adjacent positions on the phenyl ring, together form :



;

A^1 and A^2, which are the same or different, are O, $S(O)_n$, NR^7 or $NCOR^8$; n is zero, 1 or 2; and R^4, R^5, R^6, R^7 and R^8 are hydrogen or alkyl; or when A^1 is $N(CH_3)$ R^2 may also be 2-NO_2; any of the foregoing aliphatic moieties being optionally substituted with one or more of halogen, hydroxy, alkoxy or haloalkoxy, and any of the foregoing aryl, heteroalicyclyl, or heteroaryl moieties being optionally substituted with one or more of halogen, alkyl, nitro, alkoxy, haloalkyl, haloalkoxy or $CH_3O_2C.C=CH.OCH_3$.

The compounds of formula (I) contain a double bond and can, therefore, exist in (E)- or (Z)-isomeric forms. The invention relates to the individual isomers and mixtures thereof in all proportions. Generally the (E)-isomer is the more active and it is preferred that the compounds of formula (I) are in this form.

The term "halogen" used herein includes fluorine, chlorine, bromine and iodine.

Alkyl groups and the alkyl moieties of the alkoxy, alkyleneCO_2R^6, mono or dialkylamino, substituted alkyl and substituted alkoxy groups preferably contain 1 to 6, more preferably 1 to 4, carbon atoms and can be in the form of straight or branched chains. They include methyl, ethyl, n-propyl and t-butyl. Haloalkyl includes chloro- and fluoro(C_{1-4})alkyl, especially trifluoromethyl. Suitable optional substituents for the alkyl groups and alkyl moieties of alkoxy and mono or dialkylamino include one or more of halogen, hydroxy, alkoxy and haloalkoxy.

The alkyl groups of the arylalkyl, heteroarylalkyl, aryloxyalkyl, heteroaryloxyalkyl, arylalkoxy and heteroarylalkoxy moieties contain 1 to 4 carbon atoms and can be in the form of straight or branched chains.

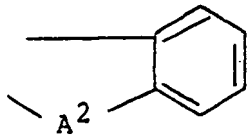
The aryl moiety of aryloxy, arylalkenyl, aryloxyalkyl and arylalkoxy groups and aryl itself includes phenyl; the heteroaryl moiety of heteroaryloxy, heteroarylalkenyl, heteroaryloxyalkyl and heteroarylalkoxy groups and heteroaryl itself includes pyridyl and pyrimidinyl; while the heteroalicyclyl moiety includes morpholino. Suitable optional substituents for aryl and heteroaryl groups include one or more of halogen, alkyl, alkoxy, haloalkyl and haloalkoxy.

The alkenyl moiety of arylalkenyl and heteroarylalkenyl groups may contain 2 to 6, suitably 2 carbon

atoms. Suitable optional substituents for the alkenyl group include one or more of halogen, hydroxy, alkoxy and haloalkoxy.

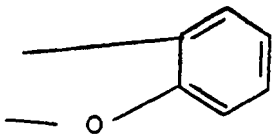
In one particular aspect, the compounds used in the method of the invention are those of formula (I) wherein A^1 is O or $S(O)_n$; n is zero, 1 or 2; R^1 is hydrogen; R^2 is hydrogen, halogen, alkyl, haloalkyl, alkoxy, aryloxy, heteroaryloxy, aryloxyalkyl, heteroaryloxyalkyl, alkoxycarbonyl, monoalkylamino or dialkylamino; and R^3 is hydrogen, halogen, hydroxy, alkyl, haloalkyl, alkoxy, alkoxycarbonyl, monoalkylamino or dialkylamino; any of the foregoing aryl or heteroaryl moieties being optionally substituted with one or more of halogen, alkyl, haloalkyl or alkoxy.

In another aspect, the compounds used in the method of the invention are those of formula (I) wherein R^1 is hydrogen or C_{1-6} alkyl; R^2 is hydrogen, halogen, C_{1-6} alkyl, C_{1-6} alkoxy, aryl, heteroaryl, heteroalicyclyl, aryl(C_{1-4})alkyl, aryloxy, heteroaryloxy, aryloxy(C_{1-4})alkyl, aryl(C_{1-4})alkoxy $-CO_2R^5$, C_{1-6} alkyleneCO_2R^6 or di(C_{1-6})alkylamino; R^3 is hydrogen, C_{1-6} alkyl, halogen, hydroxy, or C_{1-6} alkoxy; or R^2 and R^3, when they are in adjacent position on the phenyl ring together form:



A^1 and A^2, which are the same or different, are selected from O, $S(O)_n$, NR^7 or $NCOR^8$; n is zero, 1 or 2; and R^5, R^6, R^7 and R^8 are hydrogen or C_{1-6} alkyl; or when A^1 is $N(CH_3)$ R^2 may also be 2-NO_2; any of the foregoing aliphatic moieties being optionally substituted with one or more of halogen, hydroxy, C_{1-6} alkoxy or halo(C_{1-6})alkoxy, and any of the foregoing aryl, heteroalicyclyl or heteroaryl moieties being optionally substituted with one or more of halogen, C_{1-6}alkyl, nitro, phenyl, C_{1-6}alkoxy, halo(C_{1-6})alkyl, haloalkoxy or $CH_3O_2C.C=CH.OCH_3$.

In a further aspect, the compounds used in the method of the invention are those of formula (I) wherein R^1 is hydrogen or C_{1-6} alkyl; R^2 is hydrogen halogen, C_{1-6} alkyl, C_{1-6} alkoxy, phenyl, pyrimidinyl, morpholino, phenyl(C_{1-4})alkyl, phenoxy, -pyrimidinyloxy, pyridyloxy, phenoxy(C_{1-4})alkyl, phenyl(C_{1-4})-alkoxy, $-CO_2R^5$, C_{1-6} alkyleneCO_2R^6 or di(C_{1-6})alkylamino; R^3 is hydrogen, hydroxy,C_{1-6} alkyl, halogen or C_{1-5} alkoxy, or R^2 and R^3, when they are in adjacent positions on the phenyl ring, together form:



A^1 is O, $S(O)_n$, NR^7 or $NCOR^8$; n is zero, 1 or 2; and R^5, R^6, R^7 and R^8 are hydrogen or C_{1-6} alkyl; or when A^1 is $N(CH_3)$ R^2 may also be 2-NO_2; any of the foregoing aliphatic moieties being optionally substituted with one or more of halogen, hydroxy, C_{1-6} alkoxy or halo (C_{1-6})alkoxy, and any of the foregoing heteroaryl, morpholino and aryl moieties being optionally substituted with one or more of halogen, C_{1-5}alkyl, nitro, phenyl, C_{1-6} alkoxy, halo(C_{1-6})alkyl, halo(C_{1-6})alkoxy or $CH_3O_2C.C=CH.OCH_3$.

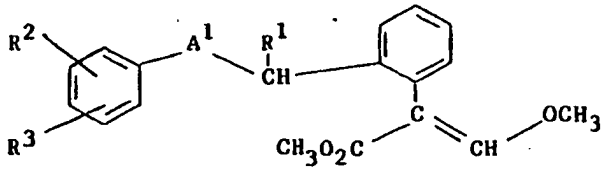
In yet a further aspect the compounds used in the method of the invention are those of formula (I) wherein R^1 is hydrogen or C_{1-6} alkyl; R^2 is hydrogen, halogen, C_{1-6} alkyl or C_{1-6} alkoxy; R^3 is hydrogen, hydroxy, C_{1-6} alkyl, halogen or C_{1-6} alkoxy; and A^1 is O; any of the foregoing aliphatic moieties being optionally substituted with one or more of halogen, hydroxy, C_{1-6} alkoxy or halo(C_{1-6})alkoxy.

In another aspect the compounds used in the method of the invention are those of formula I wherein R^1 is hydrogen or C_{1-6} alkyl; R^2 is hydrogen, fluorine, chlorine, C_{1-6} alkyl or C_{1-6} alkoxy; R^3 is hydrogen, fluorine, chlorine, C_{1-6} alkyl, C_{1-6} alkoxy, or hydroxy; and A is O; any of the foregoing aliphatic moieties are optionally substituted with one or more of fluorine, chlorine, hydroxy or C_{1-6} alkoxy itself optionally substituted with fluorine or chlorine or any combination thereof.

In a further aspect the compounds used in the method of the invention are those of formula (I) wherein R^1 is hydrogen or C_{1-4} alkyl; R^2 and R^3, which are the same or different, are hydrogen, fluorine, chlorine, C_{1-4} alkyl or C_{1-4} alkoxy, the alkyl and alkoxy groups being optionally substituted with fluorine or chlorine or any combination thereof; and A is O.

Examples of compounds of formula (I) are set out in Table I below.

TABLE I



(I)

COMPOUND NO.	A'	R^1	R^2	R^3	Isomer
1	O	H	H	H	E
2	O	H	3-Cl	H	E
3	O	H	4-Cl	H	E
4	O	H	2-Cl	5-Cl	E
5	O	H	3-Cl	4-Cl	E
6	O	H	3-I	H	E
7	O	H	3-Br	H	E
8	O	H	$3\text{-}C_6H_5O$	H	E
9	O	H	$3\text{-}CF_3$	H	E
10	O	H	$3\text{-}CH_3O$	5-Cl	E
11	O	H	3-t-C_4H_9	H	E
12	O	H	$3\text{-}N(C_2H_5)_2$	H	E
13	O	H	$3\text{-}C_2H_5O$	$4\text{-}CH_3O$	E
14	S	H	H	H	E
15	SO_2	H	H	H	E
16	O	H	$3\text{-}C_6H_5OCH_2$	H	E
17	O	H	3-(5-Cl-pyrimidin-2-yl)	H	E

TABLE I (Cont/D)

COMPOUND NO.	A^1	R^1	R^2	R^3	Isomer
18	O	H	3-$COOCH_3$	H	E
19	O	H	4-(5-CF_3 pyrid-2-yl)oxy	H	E
20	O	H	2-C_6H_5O	H	E
21	O	H	4-C_6H_5O	H	E
22	O	H	4-$C_6H_5CH_2O$	H	E
23	O	H	3,4-benzofuranyl*		E
24	O	H	3-(4-NO_2-$C_6H_5OCH_2$)	H	E
25	O	H	4,3-benzofuranyl**		E
26	O	H	3-(3,5-di-CH_3-C_6H_3O)	H	E
27	O	H	3-(2-F-C_6H_4O)	H	E
28	O	H	3-(2-CH_3-C_6H_4O)	H	E
29	O	H	3-(CH_3O-C_6H_4O)	H	E
30	O	H	3-(CH_3-C_6H_4O)	H	E
31	O	H	3-(2-Cl-C_6H_4O)	H	E
32	O	H	3-(3-Br-C_6H_4O)	H	E
33	O	H	3-(4-Cl-$C_6H_5CH_2$)	H	E
34	O	H	3-C_6H_5	H	E

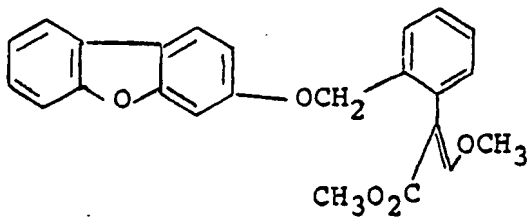
TABLE I (Cont/D)

COMPOUND NO.	A^1	R^1	R^2	R^3	Isomer
35	O	H		H	E,E
36	O	H	3-F	H	E
37	O	H	2-Cl	6-Cl	E
38	O	H	2-Cl	3-Cl	E
39	O	H	2-Cl	4-Cl	E
40	NCH_3	H	H	H	E
41	O	H	H	3-OH	E
42	O	H	$2-C_2H_5$	H	E
43	O	H	$3-CH_2OH$	H	E
44	O	Me	3-Cl	H	E
45	O	H	$2-CH_2CO_2CH_3$	H	E
46	$NCOCH_3$	H	H	H	E

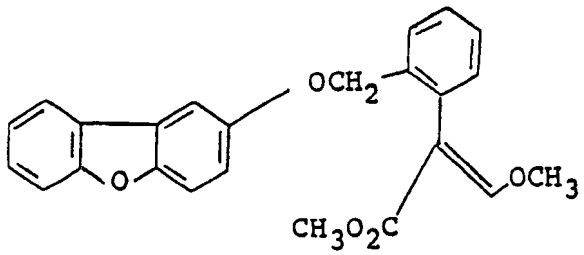
TABLE I (Cont/D)

COMPOUND NO.	A^1	R^1	R^2	R^3	Isomer
47	O	H	3-(2-CH_3OPhO)	H	E
48	O	H	2-Br	H	E
49	O	H	3-(4-NO_2-$C_6H_4CH_2O$)	H	E
50	O	H	3-Cl	5-Cl	E
51	NCH_3	H	2-NO_2	H	E
52	O	H	4-F	H	E
53	O	H	5-C_6H_5O	3-Cl	E
54	O	H	3-(pyrimidin-2-yl)oxy	H	E
55	O	H	4-Br	H	E
56	O	H	3-OMe	H	E
57	O	H	3-C_6H_5-C_6H_4O	H	E
58	O	H	3-morpholino	H	E
59	O	H	3-(4-F-C_6H_4O)	H	E
60	O	H	3-(3-F-C_6H_4O)	H	E
61	O	H	3-(3-F-C_6H_4O)	H	E

*Compound 23 is



**Compound 25 is



The compounds of formula (I) can be prepared as described in European Patent Publications Nos. 0226917 and 0278595 and the contents of those publications, in so far as they are relevant to the present invention, are incorporated herein by reference.

In order to apply the compounds to the locus of the pests they are usually formulated into compositions which include, in addition to the insecticidally active ingredient or ingredients of formula (I), suitable inert diluent or carrier materials, and/or surface active agents. In another aspect the invention includes such insecticidal compositions.

The compositions may also contain another pesticidal material, for example another insecticide, nematocide or acaricide, or a fungicide, or may also contain an insecticide synergist, such as for example dodecyl, imidazole, safroxan, MGK 264 or piperonyl butoxide.

The compositions may be in the form of dusting powders wherin the active ingredient is mixed with a solid diluent or carrier, for example kaolin, bentonite, kieselguhr, or talc, or they may be in the form of granules, wherein the active ingredient is absorbed in a porous granular material for example pumice.

Alternatively the compositions may be in the form of liquid preparations to be used as dips or sprays, which are generally aqueous dispersions or emulsions of the active ingredient in the presence of one or more known wetting agents, dispersing agents or emulsifying agents (surface active agents).

Wetting agents, dispersing agents and emulsifying agents may be of the cationic, anionic or non-ionic type. Suitable agents of the cationic type include, for example, quaternary ammonium compounds, for example cetyltrimethyl ammonium bromide. Suitable agents of the anionic type include, for example, soaps, salts of aliphatic monoesters of sulphuric acid, for example sodium lauryl sulphate, salts of sulphonated aromatic compounds, for example sodium dodecylbenzensulphonate, sodium, calcium or ammonium lignosulphonate, or butylnapthalene sulphonate, and a mixture of the sodium salts of diisopropyl- and triisopropylnaphthalene sulphonates. Suitable agents of the non-ionic type include, for example, the condensation products of ethylene oxide with fatty alcohols such as oleyl alcohol or cetyl alcohol, or with alkyl phenols such as octyl phenol, nonyl phenol and octyl cresol. Other non-ionic agents are the partial esters derived from long chain fatty acids and hexitol anhydrides, the condensation products of the said partial esters with ethylene oxide, and the lecithins.

The compositions may be prepared by dissolving the active ingredient in a suitable solvent, for example, a ketonic solvent such as diacetone alcohol, or an aromatic solvent such as trimethylbenzene and adding the mixture so obtained to water which may contain one or more known wetting, dispersing or emulsifying agents. Other suitable organic solvents are dimethyl formamide, ethylene dichloride, isopropyl alcohol, propylene glycol and other glycols, diacetone alcohol, toluene, kerosene, white oil, methylnapthalene, xylenes and trichloroethylene, N-methyl-2-pyrrolidone and tetrahydro furfuryl alcohol (THFA).

The compositions to be used as sprays may also be in the form of aerosols wherein the formulation is held in a container under pressure in the presence of a propellant such as fluorotrichloromethane or dichlorodifluoromethane.

The compositions which are to be used in the form of aqueous dispersions or emulsions are generally supplied in the form of a concentrate containing a high proportion of the active ingredient or ingredients, the

said concentrate to be diluted with water before use. These concentrates are often required to withstand storage for prolonged periods and after such storage, to be capable of dilution with water to form aqueous preparations which remain homogenous for a sufficient time to enable them to be applied by conventional spray equipment. The concentrates may contain from 5-95% suitably from 10-85% by weight of the active ingredient or ingredients. When diluted to form aqueous preparations such preparations may contain varying amounts of the active ingredient depending upon the purpose for which they are to be used. For agricultural, horticultural or domestic purposes, an aqueous preparation containing between 0.0001% and 0.1% by weight of the active ingredient is particularly useful.

In use the compositions are applied to the pests or to the locus of the pests, i.e. to the habitat of the pests or to growing plants liable to infestation by the pests, by any of the known means of applying pesticidal compositions, for example, by dusting or spraying, including electro-dynamic spraying.

The above described compositions are active against a range of pests including nematodes.

Rates of application will depend upon a number of factors including the type of pest, degree of infestation, etc. However, in general, application of from 0.5 to 4.0 kg/ha will be appropriate.

The following Examples illustrate the invention.

EXAMPLE 1

The insecticidal properties of the compound of formula (I) were demonstrated as follows :

The activity of the compound was determined using a variety of insect, mite and nematode pests. Except in the case of knockdown activity against Musca domestica, where the test procedure is described later, the compound was used in the form of liquid preparations containing from 50 to 1000 parts per million (ppm) by weight of the compound. The preparations were made by dissolving the compound in acetone and diluting the solutions with water containing 0.1% by weight of a wetting agent sold under the trade name "SYNPERONIC" NX until the liquid preparations contained the required concentration of the product. "SYNPERONIC" is a Registered Trade Mark.

The test procedure adopted with regard to each pest was basically the same and comprised supporting a number of the pests on a medium which was usually a host plant or a foodstuff on which the pests feed, and treating either or both the pests and the medium with the preparations. The mortality of the pests was then assessed at periods usually varying from one to seven days after the treatment.

The results of the tests are given in Table III for each of the products, at the rate in parts per million given in the second column as a grading of mortality designated as 9, 5 or 0 wherein 9 indicates 80-100% mortality (70-100% root-knot reduction as compared with untreated plants for Meloidogyne incognita semi in vitro test), 5 indicates 50-79% mortality (50-69% root-knot reduction for Meloidogyne incognita semi in vitro test) and 0 indicates less than 50% mortality (root-knot reduction for Meloidogyne incognita semi in vitro test).

In Table III the pest organism used is designated by a letter code and the pest species, the support medium or food, and the type and duration of test is given in Table II.

The knockdown properties against Musca domestica were demonstrated as follows.

A sample of the compound was diluted in 0.1% ethanol/ acetone (50:50 mixture) and made up to a 1000 ppm solution with 0.1% aqueous Synperonic NX solution. The solution (1 ml) was then sprayed directly onto ten mixed sex houseflies held in a drinking cup containing a sugar lump which was also sprayed.

Immediately after spraying the cups were inverted and left to dry. An assessment of knockdown was made when the cups were righted 15 minutes later. The flies were then provided with a damp cotton wool pad, and held for 48 hours in a holding room conditioned at 25° C and 65% relative humidity before a mortality assessment was made.

TABLE II

CODE LETTERS (TABLE IV)	TEST SPECIES	SUPPORT MEDIUM/FOOD	TYPE OF TEST	DURATION (days)
TU AC	Tetranychus urticae (spider mite - adult)	French bean leaf	Contact	3
TU EO	Tetranychus urticae (spider mite - egg)	French bean leaf	Contact	3
TU NG	Tetranychus urticae (spider mite - nymph)	French bean leaf	Contact (growth)	6
MP	Myzus persicae (aphid)	Chinese Cabbage leaf	Contact	3
NC NC	Nephotettix cincticeps (green leaf hopper - nymph)	Rice plant	Contact	2
NC NG	Nephotettix cincticeps (green leaf hopper - nymph)	Rice plant	Contact (growth)	6

TABLE II (Cont/D)

CODE LETTERS (TABLE IV)	TEST SPECIES	SUPPORT MEDIUM/FOOD	TYPE OF TEST	DURATION (days)
MD AK	Musca domestica (housefly - adult)	Plastic pot	Contact (knockdown)	15 mins
MD AC	Musca domestica (housefly - adult)	Plastic pot	Contact	3
BG NK	Blattella germanica (cockroach nymph)	Plastic pot	Contact (knockdown)	15 mins
BG NC	Blattella germanica (cockroach nymph)	Plastic pot	Contact	2
HV LR	Heliothis virescens (tobacco budworm - larva)	Cotton leaf	Residual	2
HV LG	Heliothis virescens (tobacco budworm - larva)	Cotton leaf	Residual (growth)	5

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TABLE II (Cont/D)

CODE LETTERS (TABLE IV)	TEST SPECIES	SUPPORT MEDIUM/FOOD	TYPE OF TEST	DURATION (days)
SP LR	Spodoptera exigua (lesser armyworm - larva)	Cotton leaf	Residual	2
SP LG	Spodoptera exigua (lesser armyworm - larva)	Cotton leaf	Residual (growth)	5
DB	Diabrotica balteata (cucumber beetle - larva)	Filter paper/ maize seed	Residual	2
MI LR	Meloidogyne incognita (rootknot nematode - larva)	Semi in vitro	Residual	7
MI JC	Meloidogyne incognita (rootknot nematode - larva)	in vitro	Contact	1

"Contact" tests indicates that both pests and medium were treated and "Residual" indicates that the medium was treated before infestation with the pests.

TABLE III

COMPOUND NO.	RATE (ppm)	TU AC	TU EO	TU NG	MP NC	NC NG	MD AK	MD AC	BG NK	BG NC	HV LR	HV LG	SP LR	SP LG	DB	MI JC	MI LR
1	500	5	0	0	0		0	0*	0		0	0	0	0	9		
	250																0
2	1000	9	9		0		0	0	0				5	9			
3	1000	9	9		0		0	9	0				9				
4	1000	9	9		5	9	5	9	0	0	9		0	9	5		
	25															0	
5	1000	9	0	9	9	0	0	9	0	0	0	0	0	0	5		
	25															0	
6	1000	0	9		0	0	0	0	0	0	0	0	0	0	0		
	25															0	
7	1000	0	9		9	0	0	0	0	0	0	0	0	0	9		
	25															0	
8	1000	9	0	9	0	0	9	9	0	0	0	0	0	0	9		
	25																5

TABLE III (Cont/D)

COMPOUND NO.	RATE (ppm)	TU AC	TU EO	TU NG	MP	NC NC	NC NG	MD AK	MD AC	BG NK	BG NC	HV LR	HV LG	SP LR	SP LG	DB	MI JC	MI LR
9	1000	9	9		9	9		9	9	0	0	0	0	5	9	9		
	25																0	
10	1000	9	5	9	0	0	0	0	0	0	0	0	0	5	9	9		
	25																0	
11	1000	9	9		9	9		9	9	0	0	0	0	0	0	9		
	25																0	
12	1000	0	0	9	0	0	0	0	0	0	0	0	0	0	0	9		
	25																0	
13	1000	5	0	5	0	0	0	0	0	0	0	0	0	0	0	9		
14	1000		0	0	0	0	0	0	0	0	0	0	9	0	0	0		
15	1000		0	0	0	9		0	0	0	0	5	5	0	0	5		
	25																0	
16	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9		
	25																9	

TABLE III (Cont/D)

COMPOUND NO.	RATE (ppm)	TU AC	TU EO	TU NG	MP	NC NC	NC NG	MD AK	MD AC	BG NK	BG NC	HV LR	HV LG	SP LR	SP LG	DB	MI JC	MI LR
17	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5		
	25																0	
18	1000	9	0	0	0	9		0	5	0	0	0	0	0	5	9		
	25																5	
19	1000	9	9		0	5	5	5	9	0	0	0	5	0	0	9		
	25																9	
20	1000	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	25																0	
21	1000	5	0	9	0	5	5	0	5	0	0	0	0	0	0	0		
	25																0	
22	1000	5	0	0	0	0	0	0	0	0	0	0		0	0	0		
	25																0	
23	1000	9	0	5	5	0	0	0	0	0	0	0	0	5	5	0		
	25																0	

TABLE III (Cont/D)

COMPOUND NO.	RATE (ppm)	TU AC	TU EO	TU NG	MP	NC NC	NC NG	MD AK	MD AC	BG NK	BG NC	HV LR	HV LG	SP LR	SP LG	DB	MI JC	MI LR
24	1000	5	0	0	0	5	5	0	0	0	0	0	0	0	0	5		
	25																0	
25	1000		9		9													
	1000	0				9				0	0			0	0	9		
	1000	9				9				0	0			0	9	0		
26	1000	9	0	5	0	5	9	5	9	0	5	0	0	5	9	5		
	25																9	
27	1000	5	0	5	0	5	5	9	9	0	0	0	0	9		0		
	25																0	
28	1000	5	0	9	0	9		5	9	0	0	0	0	0	0	0		
	25																0	
29	1000		0	9				0	5									
	1000					9				0	0			0	0	0		
	1000					0	0			0	0			0	5	0		

TABLE III (Cont/D)

COMPOUND NO.	RATE (ppm)	TU AC	TU EO	TU NG	MP NC	NC NG	MD AK	MD AC	BG NK	BG NC	HV LR	HV LG	SP LR	SP LG	DB	MI JC	MI LR
30	1000		0	9	0		5	5									
	1000		0	5			0	9									
	1000		5	9			0	9									
	1000	9			0	0			0	0			5	5	5		
	1000	9			9				0	0			0	9	5		
	25															0	
31	1000		0	9	0		5	5									
	1000		0	9			0	9									
	1000	0			0	0			0	0			0	0	0		
	1000	0			5	5			0	0			0	9	0		
	25															0	
32	1000		0	9	0		0	0									
	1000		0	9													
	1000	9			0	0			0	0			0	0	0		
	25															0	
33	1000	9	0	9	5	5	9	9	0	0			0	9	0		
	25															0	
34	1000	9	9		0	5	5	0	0	0	0	0	0	0	9		
	25															0	
35	1000	0	0	0	9	0	0	0	0	0	0	0	0	0	5		
	25															0	

TABLE III (Cont/D)

COMPOUND NO.	RATE (ppm)	TU AC	TU EO	TU NG	MP	NC NC	NC NG	MD AK	MD AC	BG NK	BG NC	HV LR	HV LG	SP LR	SP LG	DB	MI JC	MI LR
36	1000	0	9		0	9		0	0	0	0	0	0	5	5	0		
	25																0	
37	1000	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	25																0	
38	1000	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0		
	25																0	
39	1000	5	0	0	0	9		9	9	0	0	0	0	5	5	0		
	25																0	
40	1000	5	0	0	0	5	5	0	0	0	0	0	0	0	0	0		
	25																0	
41	1000	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0		
	25																0	
42	1000		0	9				0	0									
	1000	0				5	5			0	0			0	0	0		

TABLE III (Cont/D)

COMPOUND NO.	RATE (ppm)	TU AC	TU EO	TU NG	MP	NC NC	NC NG	MD AK	MD AC	BG NK	BG NC	HV LR	HV LG	SP LR	SP LG	DB	MI JC	MI LR
43	1000	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0		
	25																5	
44	1000	5	0	0	0	9		0	0	0	0	0	0	0	0	0		
	25																0	
45	1000	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	25																0	
46	1000	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0		
	25																0	
47	1000		0	9				0	0									
48	1000		0	5				0	0									
	1000	0				0	0			0	0			0	9	0		

TABLE III (Cont/D)

COMPOUND NO.	RATE (ppm)	TU AC	TU EO	TU NG	MP	NC NC	NC NG	MD AK	MD AC	BG NK	BG NC	HV LR	HV LG	SP LR	SP LG	DB	MI JC	MI LR
49	1000	9	0	9	0	0	0	0	0	0	0	9	0	0	0	0		
	25																0	
50	900		0	9	9			0	9				0	0				
	50																9	
	1000		0	0	0			0	0									
	25																0	
51	1000	0	0	0	0	0	5	0	0	0	0	0	0	0	0	5		
	25																0	
52	1000	9	5	9	0	9		9	9	0	0	0	0	0	0	9		
	25																0	
53	1000		0	9	0			0	0			0	0					
	25																0	
54	1000	0	0	5	0	5	5	0	0	0	0	0	0	0	0	0		
	25																0	

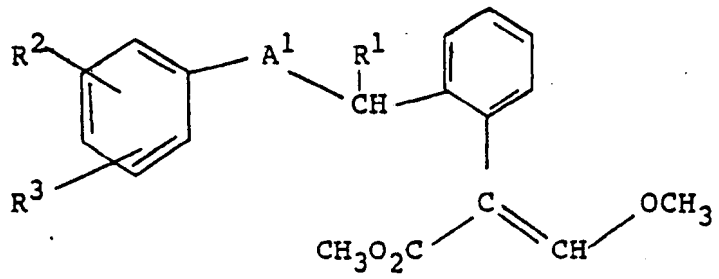
TABLE III (Cont/D)

COMPOUND NO.	RATE (ppm)	TU AC	TU EO	TU NG	MP	NC NC	NC NG	MD AK	MD AC	BG NK	BG NC	HV LR	HV LG	SP LR	SP LG	DB	MI JC	MI LR
55	1000	9	0	0	0	0	0	0	5	0	0	0	0	0	0	0		
	25																0	
56	1000	9	0	9	0	9		5	5	0	0	0	0	0	0	9	0	
	25																	
57	1000	0	9		0	5	9	0	0	0	0	0	0	0	0	0		
	25																0	
58	1000	9	0	0	0			0	0	0	0	0	0	9		0		
	25																0	
59	1000	5	0	9	0			0	9	0	0	0	0	0	0	0		
	25																0	
60	1000	9	0	9	0			0	5	0	0	0	0	0	0	0		
	25																0	

* Assessment after one day.
A blank space indicates not tested

Claims

1. A method of killing or controlling insect, mite or nematode pests which method comprises applying to the pest or to the locus thereof an effective amount of a compound of formula (I) :



(I)

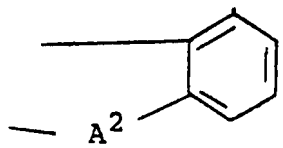
wherein R^1 is hydrogen or alkyl; R^2 is hydrogen, halogen, alkyl, alkoxy, hydroxy, aryl, heteroaryl, heteroalicyclyl, arylalkyl, heteroarylalkyl, aryloxy, heteroaryloxy, arylalkenyl, heteroarylalkenyl, aryloxyalkyl, heteroaryloxyalkyl, arylalkoxy, heteroarylalkoxy, $-CO_2R^5$, alkyleneCO_2R^6, monoalkylamino or dialkylamino; R^3 is hydrogen, halogen, alkyl, alkoxy, hydroxy, monoalkylamino, dialkylamino or $-CO_2R^4$; or R^2 and R^3, when they are in adjacent positions on the phenyl ring, together form :

A^2 ;

A^1 and A^2, which are the same or different, are O, $S(O)_n$, NR^7 or $NCOR^8$; n is zero, 1 or 2; and R^4, R^5, R^6, R^7 and R^8 are hydrogen or alkyl; or when A^1 is $N(CH_3)$ R^2 may also be 2-NO_2; any of the foregoing aliphatic moieties being optionally substituted with one or more of halogen, hydroxy, alkoxy, or haloalkoxy, and any of the foregoing aryl, heteroalicyclyl or heteroaryl moieties being optionally substituted with one or more of halogen, alkyl, nitro, phenyl, alkoxy, haloalkyl, haloalkoxy or $CH_3O_2C.C=CH.OCH_3$.

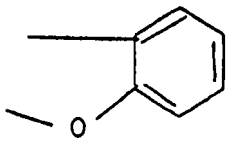
2. A method of killing or controlling insect, mite or nematode pests which method comprises applying to the pest or to the locus thereof an effective amount of a compound of formula (I) wherein A^1 is O or $S(O)_n$; n is zero, 1 or 2; R^1 is hydrogen; R^2 is hydrogen, halogen, alkyl, haloalkyl, alkoxy, aryloxy, heteroaryloxy, aryloxyalkyl, heteroaryloxyalkyl, alkoxycarbonyl, monoalkylamino or dialkylamino; and R^3 is hydrogen, halogen, hydroxy, alkyl, haloalkyl, alkoxy, alkoxycarbonyl, monoalkylamino or dialkylamino; any of the foregoing aryl or heteroaryl moieties being optionally substituted with one or more of halogen, alkyl, haloalkyl or alkoxy.

3. A method according to claim 1 wherein R^1 is hydrogen or C_{1-6} alkyl; R^2 is hydrogen, halogen, C_{1-6} alkyl, C_{1-6} alkoxy, aryl, heteroaryl, heteroalicyclyl, aryl(C_{1-4})alkyl, aryloxy, heteroaryloxy, aryloxy(C_{1-4})-alkyl, aryl(C_{1-4})alkoxy, $-CO_2R^5$, C_{1-6} alkyleneCO_2R^6, or di(C_{1-6}) alkylamino; R^3 is hydrogen, C_{1-6} alkyl, halogen, hydroxy, C_{1-6} alkoxy or R^2 and R^3, when they are in adjacent positions on the phenyl ring together form:



A^1 and A^2, which are the same or different, are selected from O, $S(O)_n$, NR^7 or $NCOR^8$; n is zero, 1 or 2; and R^5, R^6, R^7 and R^8 are hydrogen or C_{1-6} alkyl; or when A^1 is $N(CH_3)$ R^2 may also be 2-NO_2; any of the foregoing aliphatic moieties being optionally substituted with one or more of halogen, hydroxy, C_{1-6}alkoxy or halo(C_{1-6})alkoxy, and any of the foregoing aryl, heteroalicyclyl or heteroaryl moieties being optionally substituted with one or more of halogen, C_{1-6} alkyl, nitro, phenyl, C_{1-6} alkoxy, halo(C_{1-6})alkyl, halo(C_{1-6})-alkoxy or $CH_3O_2C.C=CH.OCH_3$.

4. A method according to claim 1 or 3 wherein R^1 is hydrogen or C_{1-6} alkyl; R^2 is hydrogen, halogen, C_{1-6} alkyl, C_{1-6} alkoxy, phenyl, pyrimidinyl, morpholino, phenyl(C_{1-4})alkyl, phenoxy, pyrimidinyloxy, pyridyloxy, phenoxy(C_{1-4})alkyl, phenyl(C_{1-4})alkoxy, $-CO_2R^5$, C_{1-6} alkyleneCO_2R^6 or di(C_{1-6})alkylamino; R^3 is hydrogen, hydroxy, C_{1-6} alkyl, halogen or C_{1-6} alkoxy; or R^2 and R^3, when they are in adjacent positions on the phenyl ring, together form:



A^1 is O, $S(O)_n$, NR^7 or $NCOR^8$; n is zero, 1 or 2; and R^5, R^6, R^7 and R^8 are hydrogen or C_{1-6} alkyl; or when A^1 is $N(CH_3)$ R^2 may also be 2-NO_2; any of the foregoing aliphatic moieties being optionally substituted with one or more of halogen, hydroxy, C_{1-6} alkoxy or halo(C_{1-6}) alkoxy; and any of the foregoing heteroaryl, morpholino and aryl moieties being optionally substituted with one or more of halogen, C_{1-5} alkyl, nitro, phenyl, C_{1-6} alkoxy, halo(C_{1-6}) alkyl, halo(C_{1-6})alkoxy or $CH_3O_2C.C=CH.OCH_3$.

5. A method according to any one of claims 1, 3 or 4 wherein R^1 is hydrogen or C_{1-6} alkyl; R^2 is hydrogen, halogen, C_{1-6} alkyl or C_{1-6} alkoxy; R^3 is hydrogen, hydroxy, C_{1-6} alkyl, halogen or C_{1-6} alkoxy; and A^1 is O; any of the foregoing aliphatic moieties being optionally substituted with one or more of halogen, hydroxy, C_{1-6} alkoxy or halo(C_{1-6})alkoxy.

6. A method according to any one of claims 1, 3, 4 or 5 wherein R^1 is hydrogen or C_{1-6} alkyl; R^2 is hydrogen, fluorine, chlorine, C_{1-6} alkyl or C_{1-6} alkoxy; R^3 is hydrogen, fluorine, chlorine, C_{1-6} alkyl, C_{1-6} alkoxy or hydroxy; and A' is O; any of the foregoing aliphatic moieties being optionally substituted with one or more of fluorine, chlorine, hydroxy or C_{1-6} alkoxy itself optionally substituted with fluorine or chlorine or any combination thereof.

7. A method according to any one of claims 1, 3, 4, 5, or 6 wherein R^1 is hydrogen or C_{1-4} alkyl; R^2 and R^3 which are the same or different, are hydrogen, fluorine chlorine, C_{1-4} alkyl or C_{1-4} alkoxy, the alkyl and alkoxy groups being optionally substituted with fluorine or chlorine or any combination thereof; and A' is O

8. An insecticidal, miticidal or nematicidal composition for use in a method according to claim 1, comprising a compound of formula (I), wherein A^1, R^1, R^2 and R^3 have values as defined in claim 1, in combination with a carrier or diluent.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 30 2330

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,X	EP-A-0 226 917 (BASF AG) * Claims *	1-8	A 01 N 37/38 A 01 N 37/40 A 01 N 37/44 A 01 N 37/46 A 01 N 41/10 A 01 N 43/12 A 01 N 43/40 A 01 N 43/54
D,P,X	EP-A-0 278 595 (IMPERIAL CHEMICAL INDUSTRIES PLC) * Compounds no. 189,190; claims *	1-8	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

A 01 N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18-05-1989	RAVANEL C.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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